Sub A1

~~1. An electrochemical storage medium comprising a carrier mixed with a reduced boron-containing compound, the reduced compound being oxidizable to an oxidized boron-containing compound concurrent with the generation of an electric current, the storage medium being in electrical contact with an electrode for carrying current generated during that oxidation.~~

a ~~2. The storage medium of claim 1 in which the reduced compound is a borohydride $(BH_4)^-$.~~

2 ~~3~~. The storage medium of claim ~~1~~ 1 in which the oxidized compound is a borate $(BO_2)^-$.

3 ~~4~~. The storage medium of claim ~~1~~ 1 in which the carrier is an aqueous solution.

4 ~~5~~. The storage medium of claim ~~1~~ 1 in which the carrier is a non-aqueous solution.

a 5 ~~6~~. The storage medium of claim ~~5~~ 4 in which the carrier is a non-aqueous solution comprising a liquid that dissolves the ~~reduced~~ compound.

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6 ~~7~~. The storage medium of claim ~~6~~ 5 in which the carrier is selected from the group consisting of: anhydrous ammonia; amines; non-amine organic bases; alcohols; alkene carbonates; and glycols.

7 ~~8~~. The storage medium of claim ~~6~~ 5 in which the carrier is selected from the group consisting of: dimethylformamide; dimethylsulfoxide; tripropylamine; pyridine; quinoline; triethanolamine; monethanolamine;

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ethylene glycol; propylene glycol; methanol; ethanol; ethylene carbonate; and propylene carbonate.

~~9.~~ 8 The storage medium of claim ~~6~~ 5 in which the non-aqueous solution comprises a solubilizer or a conductivity enhancer.

~~10.~~ 9 The storage medium of claim ~~6~~ 5 in which the non-aqueous solution comprises an agent selected from the group consisting of EDTA, crown ethers, cryptates, and quaternary ammonium salts.

~~11.~~ 10 The storage medium of claim ~~1~~ 1 positioned to be the anode of a battery.

Sub A9

~~12. A battery comprising an anode and a cathode in electrical communication,~~

~~the anode comprising a carrier mixed with a reduced boron-containing compound, the reduced compound being oxidizable to an oxidized boron-containing compound concurrent with the discharge of the battery.~~

~~13.~~ The battery of claim ~~12 in which~~ the reduced compound is a ~~borohydride (BH_4)$^-$~~.

~~14.~~ 12 The battery of claim ~~12~~ 11 ~~or claim 13~~ in which the oxidized compound is a borate $(BO_2)^-$.

~~15.~~ 13 The battery claim ~~12~~ 11 in which the carrier is a solution.

~~16.~~ 14 The battery of claim ~~12~~ 11 in which the carrier is an aqueous mixture.

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15 ~~17~~. The battery of claim 11 ~~12~~ in which the carrier is a non-aqueous mixture.

16 ~~18~~. The battery of claim 11 ~~12~~ in which the cathode comprises a catholyte which includes an oxidizing agent.

17 ~~19~~. The battery of claim 16 ~~18~~ in which the oxidizing agent is selected from: air; O_2; compounds comprising oxygen and a halogen; and X_2, where X is a halogen.

18 ~~20~~. The battery of claim 17 ~~19~~ in which the oxidizing agent is perchlorate (ClO_4^-), chlorate (ClO_3^-), chlorite (ClO_2^-), hypochlorite (OCl^-), chlorine (Cl_2), bromine (Br_2), bromate (BrO_3^-), or iodate (IO_3^-).

19 ~~21~~. The battery of claim 16 ~~18~~ in which the oxidizing agent is a) $[MnO_4]^-$; b) $[FeO_4]^{-2}$; c) $CeOH(NO_3)_3$; d) $[Ce(NO_3)_6]^{-2}$; e) $[Fe(CN)_4]^{-3}$; f) $[CrO_4]^{-2}$; g) $[SnO_3]^{-2}$; h) $[BiO_3]^-$; i) MnO_2; j) Ag_2O; k) AgO; l) CeO_2; m) PbO_2; n) NiO(OH); o) NiO_2; p) CoO(OH); q) $[NO_3]^-$; r) $[NO_2]^-$; s) $[S_2O_8]^{-2}$; t) compounds containing Cu(III), Tl(III), Hg (II), Se (VI), or Te(VI); or u) $R(NO_2)_n$ where R is an alkyl, aryl, or arylakyl organic group and n = 1-6.

20 ~~22~~. The battery of claim 16 ~~18~~ in which the oxidizing agent is trinitrobenzoic acid, hexanitrobenzene, or trinitrobenzene.

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~~23.~~ 21. A battery as in claim ~~12~~ 11 in which the anode comprises an anolyte, the cathode comprises a catholyte, and the anolyte and catholyte are separated by a permiselective membrane.

~~24.~~ 22. A battery as in claim ~~23~~ 21 in which the membrane is an anionic membrane.

~~25.~~ 23. A battery as in claim ~~23~~ 21 where the membrane is a cationic membrane.

~~26.~~ 24. A battery as in claim ~~23~~ 21 where the membrane is bipolar.

~~27.~~ 25. A battery as in claim ~~12~~ 11 ~~or claim 13~~ where the cathode is an air breathing cathode.

~~28.~~ 26. A battery as in claim ~~12~~ 11 which comprises a catholyte which can be oxidized by air to produce an agent that then oxidizes borohydride to borate with the generation of electrical current.

~~29.~~ 27. A battery as in claim ~~28~~ 26 wherein the catholyte is reoxidized by air in a cycle after it has generated electricity by oxidizing the borohydride, thus allowing its reuse.

~~30.~~ 28. A battery as in claim ~~28~~ 26 wherein the catholyte comprises of oxidizing agents that can be oxidized by air in basic solution.

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29 ~~31~~. A battery as in claim 28 ~~30~~ wherein the catholyte contains iodate (IO_3) and I^-.

30 ~~32~~. A battery as in claim 28 ~~30~~ in which the catholyte contains ferricyanide and ferrocyanide.

31 ~~33~~. A battery as in claim 28 ~~30~~ in which the catholyte contains chromate and Cr+3.

32 ~~34~~. A battery as in claim 28 ~~30~~ in which the catholyte contains manganese at valence +2 and +3.

33 ~~35~~. A battery claim 28 ~~30~~ in which the catholyte contains tin at valence +2 and +4.

34 ~~36~~. A battery as in claim 28 ~~30~~ in which the catholyte contains Cobalt at valence +2 and +3.

35 ~~37~~. A battery as in claim 28 ~~30~~ in which the catholyte comprises a catalyst to aid the reoxidation of the oxidation agent to the higher oxidation state by air.

36 ~~38~~. A battery as in claim 26 ~~28~~ comprising a chamber separate from the cathode compartment in which reoxidation of the catholyte takes place.

37 ~~39~~. A battery as in any one of claims 26-36 ~~28-38~~ comprising two units, one that is the direct air breather, and another unit which comprises a catholyte which can be oxidized by air and can then oxidize borohydride to borate with the generation of electrical current.

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~~40.~~ 38. A battery as in claim ~~12~~ 11 or claim ~~28~~ 26 which contains a bi polar electrode.

~~41.~~ 39. A battery as in claim ~~12~~ 11 or claim ~~28,~~ 26 further comprising external storage tanks for storage of anolyte, catholyte or both anolyte and catholyte.

SUB A3

~~42. A battery of claim 12 or claim 28 comprising a cell to generate electricity by oxidation of the reduced compounds which is physically separated from a second cell for generating the reduced compound from the oxidized compound.~~

~~43. A battery as in claim 12 or claim 28 comprising a cell which is used both to generate electricity from the oxidation of the reduced compound and to generate the reduced compound from the oxidized compound.~~

~~44.~~ 42. A battery as in claim ~~12~~ 11 or claim ~~28~~ 26 comprising a controller connected to at least one source of a reactant, the controller determining the transport of the reactant to the anode or the cathode, the battery further comprising a monitor to determine a battery characteristic and to produce a signal to the controller in response to monitored values of the characteristic.

~~45.~~ 43. A battery as in claim ~~44~~ 42 where the monitor comprises at least one probe which generates an input signal responsive to a characteristic selected from the group consisting of ORP, conductivity, voltage, current and power output, ion concentration, pH, index of refraction, colorimetric, COD, turbidity~~,~~ and density, the input signal being transmitted to an electronic processor, the processor being connected to

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the controller which controls flow into a battery compartment.

~~46~~ 44. A battery as in claim ~~12~~ 11 or claim ~~28~~ 24 which comprises an electrode comprising a conductive substrate which is coated.

~~47~~ 45. A battery as in claim ~~12~~ 11 or claim ~~28~~ 24 which comprises an electrode, the electrode comprising a substance selected from the group consisting of: a) an alloy of bismuth, thallium, cadmium, tin, lead, gallium, or indium; b) mercury, mercury amalgamated with other metals, or mercury coated on a conductive substrate; c) tellurium or tellurides.

Sub A4

~~48. A battery as in claim 12 or claim 28, which comprises an electrode, the electrode comprising a material to enhance electrode properties such as corrosion resistance.~~

~~49. A battery as in claim 47 in which the electrode further comprises a material to enhance electrode properties such as corrosion resistance.~~

~~50. The battery of claim 47 in which the electrode is a bipolar electrode comprising two sides, one of the sides being coated with said substance, and a second side being coated with a material of low oxygen overvoltage such as gold, or iridium oxide.~~

~~51~~ 49. A battery as in claim ~~47~~ 45 in which the electrode is a bipolar electrode having two sides, one of the sides

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being coated with said substance, and a second side having an air breathing electrode.

50 ~~52~~. A battery as in claim 38 ~~40~~ in which the bi polar electrode comprises a sheet of conductive material.

51 ~~53~~. A battery as in claim 50 ~~52~~ in which the conductive material is stainless steel or gold plated copper.

54. A battery as in claim 12 comprising an electrode having a smooth or high surface area of foam metal or tubes, cylinder, fibers, or other geometric shape, powder, coated or uncoated catalyzed or uncatalyzed.

55. A battery as in claim 12 configured as a sealed unit of physical size and shape and correct voltage range to meet form fit and function specifications of a standard battery for a consumer electronic or electrical device.

56. A battery as in claim 55 in which the standard battery is: a button for a hearing aid; AAA; AA; A; B; C; D; 9 volt; a computer battery; a cellular phone battery.

55 ~~57~~. A battery as in claim 11 ~~12~~ characterized by voltage and current production suitable for ignition and starter motor operation in a vehicle powered by an internal combustion engine.

54 ~~58~~. A battery as in claim 11 ~~12~~ or 26 ~~28~~ in which at least one of the cells is configured to be suitable for installation on a vehicle that uses electricity either partially or entirely to propel the vehicle.

~~59~~ 57. A battery as in claim ~~39~~ 37 in which at least one of the cells is configured to be suitable for installation on a vehicle that uses electricity either partially or entirely to propel the vehicle.

Sub A6

60. A battery as in claim 12 or 28 configured to be suitable for storage of electricity for applications such as electric utility load leveling and other means of storage of electricity.

61. A battery as in claim 39 configured to be suitable for storage of electricity for applications such as electric utility load leveling and other means of storage of electricity.

62. A method of generating a current over time comprising,

providing the battery of claim 12 and connecting it to a load.

63. The method of claim 62 further comprising the step of generating an electrical current by oxidation of borohydride anion to borate anion, and recharging the battery by applying an electrical potential to the anode to regenerate borohydride anion from borate anion.

64. The method of claim 62 further comprising the step of generating an electrical current by oxidation of borohydride anion to borate anion, and then replacing discharged anolyte with anolyte comprising borohydride anion suitable for oxidation to borate anion.

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65. A method of synthesizing a borane ion by electrical reduction of borate ion.

66. A method according to claim 65 in which the borane ion is borohydride.

67. A method according to claim 65 or 66 in which the method recharges a battery.

68. A method as in claim 65 comprising monitoring the synthesis using of a probe which generates an electrical signal representative of a characteristic selected from ORP, conductivity, voltage, current and power input, ion concentration, pH, index of refraction, colorimetric, COD, turbidity, density, said signal being transmitted to an electronic processor, the processor being connected to the controller which controls flow into a cell compartment which is connected to a regulate flow into each compartment.

69. A method according to claim 66 in which the borate and borohydride ion are in an aqueous carrier.

70. A method as in claim 69 in which the electrical reduction of borate takes place in a cell having as a cathode an electrode of high hydrogen overpotential.

71. An method as in claim 70 in which the reduction of borate ions is accomplished by applying a potential to an electrode comprising: a) an alloy of bismuth, thallium, cadmium, tin, lead, gallium and indium; b) mercury or mercury amalgamated with other metals or mercury coated on a conductive substrate or c) tellurium or tellurides to

further inhibit the release of hydrogen gas while current is passed through.

72. A method in claim 65 or claim 71 in which the reduction of borate ions is accomplished by applying a potential to an electrode comprising an additive to enhance corrosion resistance or other electrode properties.

73. The method as in claim 70 which further comprises recovering a reduced species in addition to borohydride, the reduced species comprising a metal or a compound from an aqueous and/or non aqueous systems.

74. A method of claim 70 in which the cell contains a bi-polar electrode.

75. A method according to claim 65 or claim 66 which is performed in a cell containing a permiselective membrane.

76. The method of claim 75 in which the permiselective membrane is an anionic membrane, a cationic membrane, or a bipolar membrane.

77. A method as in claim 65 or claim 66 which comprises releasing oxygen from an anode while producing borohydride in a catholyte.

78. A method as in claim 65 or claim 66 which comprises producing an oxidized species as a product in an anode chamber.

79. A method as in claim 65 or claim 66 which is performed in an aqueous medium.

80. The method of claim 65 wherein the borane is not borohydride, and the method comprising adding partial reduction adducts or other adducts to the catholyte.

81. The method of claim 80 in which the adducts are selected from the group consisting of cyanide ion, amide ion, halide ions, and pseudohalides.

82. A method as in claim 65 or claim 66 which is performed in a non aqueous medium.

83. A system of transporting a borohydride anion from a generation point to a consumption point, by applying an electrical potential to a solution of oxidized borohydride at the generation point to produce borohydride in a first cell and transporting the resulting borohydride solution to the consumption point where the borohydride is provided for oxidization in a second cell.

84. A system as in claim 83 further comprising transporting spent solution comprising oxidized borohydride from a consumption point to the generation site and applying the electrical potential to the spent solution at the generation point to produce borohydride in the first cell.

85. A system such as in claims 83 or 84 wherein the oxidized borohydride solution is transported back to the generation point to be reused for generation of borohydride.

86. A system as in any one of claims 83 or 84 in which at least one of the cells is configured to be suitable for installation on a vehicle that uses electricity either partially or entirely to propel the vehicle.

87. A system as in any one of claims 83 or 84 configured to be suitable for storage of electricity for applications such as electric utility load leveling and other means of storage of electricity.

88. A system as in claim 83 further comprising a step in which the borohydride is combined with water to generate hydrogen by reduction of water.

89. A system as in claim 88 in which the generation of hydrogen is catalyzed by the presence of transition metal compounds.

90. The system of clam 89 in which the generation of hydrogen is catalyzed by a cobalt (II) compound.

91. The system of claim 90 in which the cobalt(II) compound is cobalt(II)hydroxide.

92. The system of claim 88 further comprising a step of transporting the generated hydrogen to a consumer.

93. A system of transporting borohydride as a method of transporting energy to a given location.

94. A system of transporting and distributing borohydride such that vehicles that operate with borohydride

may fill up with fresh borohydride and discharge the borates.

~~95. A system such as in claim 94 where the borate solution is converted to borohydride solution with a cell for synthesizing borohydride ion and/or recharging a battery by electrical reduction of borate ion.~~

Add A7